AMENDMENT TO THE SPECIFICATION

Please delete the current tile and replace it with –METHOD AND APPARATUS FOR PROVIDING END-TO-END LEVEL OF SERVICE IN MULTIPLE TRANSPORT PROTOCOL ENVIRONMENTS--.

Please replace the paragraph beginning at page 1, line 20, with the following rewritten paragraph:

This application is a continuation-in-part of copending application Serial No. 09/435,549 filed November 8, 1999, ~~now US Patent No. _____~~ now abandoned. The entire disclosure of this related application is expressly incorporated herein by reference.

Please replace the paragraph beginning at page 2, line 18, with the following rewritten paragraph:

The prevalent communications protocol used by the Internet is Transmission Control Protocol / Internet Protocol ("TCP/IP"). However, because TCP/IP was originally designed to transfer data, it has limited capability in guaranteeing QoS for non-real time data applications. Real-time applications such as voice and video, which require guaranteed QoS and multi-service provisioning, are therefore not adequately supported by TCP/IP. For example, when a user executes real-time applications such as voice or video, such applications ~~needs~~ may need to be supported with multi-service provisioning and guaranteed QoS which includes bounded delay and delay variance. Such applications may impose significant constraints on delay and/or delay variations. Generally speaking, the user does not sense degradation in the quality of the signal as long as the delay and/or delay variations are bounded.

Please replace the paragraph beginning at page 3, line 21, with the following rewritten paragraph:

Permanent Virtual Circuit ("PVC") and Switched Virtual Circuit ("SVC") represent two of the most prevalent connection methodologies for ATM networks

currently known in the art. PVC uses pre-established connections that can be configured by an operator. The operator can establish a PVC by setting up a Virtual Path ("VP") or Virtual Channel ("VC") between a server and a client machine, either directly or through a series of ATM connections. When VPs or VCs are established, Virtual Path Identifier ("VPI") or Virtual Circuit Identifier ("VCI") values become available. If either the VPI or VCI values are provided, a user can connect to a server using a PVC. Such a PVC can be established through multifarious physical interconnect media and protocol combinations, such as Point-to-Point Protocol ("PPP") over ATM over Digital Subscriber Line ("DSL"). The PVC, ~~therefore~~ therefore, serves as a connection path that ensures QoS for user applications that communicate with the server.

Please replace the paragraph beginning at page 4, line 10, with the following rewritten paragraph:

In the SVC arrangement, pre-established connections are not available, thereby precluding the existence of VPI and VCI values. In order to effectuate a connection between a user and a server via an SVC connection, the ATM address of the server is utilized. Such an address may become available when the user normally browses over the Internet. When the user acquires the ATM address of the server, an SVC connection can be then be established. Thus, a connection between a user and a server can occur using either ~~and~~ a SVC or a PVC.

Please replace the paragraph beginning at page 8, line 3, with the following rewritten paragraph:

The QoS selection and negotiation procedures of the present invention allow a user application to connect to one of a plurality of servers having a desired QoS profile, using either permanent virtual ~~circui~~ circuit ("PVC") or switched virtual circuit ("SVC") connection types and regardless of the transport protocols used in the underlying network. Virtual path identifier ("VPI") and virtual circuit identifier (VCI") values, in addition to asynchronous transfer mode ("ATM") address information, allow

the QoS selection procedures to determine ~~wither~~ whether a PVC or SVC connection can be established between the application and the server. A database of server QoS profiles and connection data allows the QoS selection procedures to choose which server to connect to, based upon the QoS profiles of the servers stored in the database. End-to-end QoS between the user application and the server can be guaranteed, further allowing applications having high QoS requirements to exchange data reliably and with minimal interruption.

Please replace the paragraph beginning at page 8, line 15, with the following rewritten paragraph:

According to the present invention, a given user application executing on a client machine and having specific QoS requirements can utilize QoS selection and ~~negotation~~ negotiation procedures of the present invention to effectuate a reliable PVC or SVC connection between the application and a desired server. The establishment of PVC or SVC connections between the client machine and the desired server is effectuated by QoS selection procedures, which may be implemented in QoS negotiation ("QoSN") apparatuses or processes residing in both the client machine and the desired server. Further, the QoS selection and negotiation procedures of the present invention may be implemented either in software or in hardware.

Please replace the paragraph beginning at page 14, line 10, with the following rewritten paragraph:

In step **160**, a determination is made as to whether a plurality of servers having the ~~desire~~ desired QoS profile exist. If many servers exist, step **160** invokes step **166,** wherein a single server having the desired QoS profile is selected, based upon least round-trip time and other communications parameters. Then, step **166** invokes step **164**, described above. Alternatively, if step **160** determines that a plurality of servers having the desired QoS profile do not exist, step **160** invokes step **164**.

Please replace the paragraph beginning at page 20, line 21, with the following rewritten paragraph:

Referring now to **FIG. 4**, depicted is a diagram showing an exemplary protocol stack containing the QoS selection and ~~negotation~~ negotiation procedures of the present invention **10**. QoS selection procedures may be embodied as QoS selector **400**, which forms part of QoS negotiator **402**. Both QoS selector **400** and QoS negotiator **402** reside at application layer **404**, along with the user application. Below link layer **404**, QoS selector **400**, and QoS negotiator **402** are transport layer **406**, network layer **408**, and data link layer **410**. Various protocols known in the art may reside at these layers, thereby allowing QoS selector **400** and QoS negotiator **402** to operate with a wide array of such protocols.

AMENDMENT TO THE CLAIMS

Please amend claims 4 and 10-13 as shown below.

Please add new claims 18-46.

1. (Original) A method for providing end-to-end QoS for applications running in multiple transport protocol environments which comprises:

formulating a query message at a client machine, said query message containing a source IP address and a QoS profile requirement of a user application;

sending the query message to a server machine;

decoding the query message at the server machine;

determining availability of PVC connections and SVC connections at the server;

formulating a response message at the server machine, said response message containing server information and the availability of the PVC connections and the SVC connections;

sending the response message to the client machine;

decoding the response message at the client machine; and

connecting the client machine to the server machine based upon the response message.

2. (Original) The method of claim 1, further comprising:

connecting the client machine to the server machine using the PVC connection when the response message indicates that the PVC connection is available.

3. (Original) The method of claim 2, further comprising:

connecting the client machine to the server machine using the SVC connection when the response message indicates that the SVC connection is available.

4. (Currently Amended) The method of claim ~~13~~, further comprising:

receiving additional response messages ~~message~~ from the server;

extracting server information stored in the additional response messages; and

storing the server information in a connection database at the client machine.

5. (Original) The method of claim 4 further comprising repeating the steps of claim 4 until a server having the QoS profile has been identified.

6. (Original) The method of claim 5 further comprising connecting the client machine to the server having the desired QoS profile.

7. (Original) A method for establishing end-to-end QoS for a client machine which comprises:

querying a plurality of servers for a connection response;

receiving the connection response from at least one of the plurality of servers, the connection response comprising a QoS level, server information, and connection information;

extracting the QoS level, server information, and connection information from the connection response;

storing the QoS level, server information, and connection information in a connection database;

searching the connection database for a server having a desired QoS level;

repeating the steps of querying, receiving, extracting, storing, and searching until the server having the desired QoS level is identified.

8. (Original) The method of claim 7, further comprising:

retrieving the server information and the connection information from the connection database;

selecting a desired server based upon the server information and the network information; and

negotiating a connection between the client application and the desired server using a PVC connection or a SVC connection between the client application and the desired server.

9. (Original) The method of claim 8, further comprising repeating the steps of retrieving, selecting, and negotiating when a new connection is requested by the client application.

10. (Currently Amended) An apparatus for providing end-to-end QoS for a client application which comprises:

a QoS selector located at a client machine, the QoS selector ~~gathering~~ configured to gather client application QoS requirements and ~~formulating~~ to formulate connection requests;

a second QoS selector located at a server machine, the second QoS selector ~~receiving~~ configured to receive the connection requests and ~~formulating~~ to formulate connection responses indicating PVC connection availability and SVC connection availability;

means for storing server information at the client machine; and

connection means located at the client machine, said connection means receiving the connection response and connecting the client application to the server machine based upon the connection response.

11. (Currently Amended) The apparatus of claim 10, wherein the first QoS selector ~~stores~~ is configured to store an IP address of the client machine in the connection request.

12. (Currently Amended) The apparatus of claim 11, wherein the second QoS selector ~~stores~~ is configured to store VPI/VCI connection pair values in the connection response when a PVC connection exists at the server machine.

13. (Currently Amended) The apparatus of claim 12, wherein the second QoS selector ~~includes~~ is configured to store an ATM address of the server machine when an SVC connection exists at the server machine.

14. (Original) The apparatus of claim 13, wherein the connection means establishes a PVC connection between the client machine and the server machine when the VPI/VCI connection pair values are detected in the connection response.

15. (Original) The apparatus of claim 14, wherein the connection means establishes an SVC connection between the client machine and the server machine when the ATM address is detected in the connection response.

16. (Original) The apparatus of claim 15, wherein the storage means extracts ATM connection information, server mapping information, server QoS information, and server address information from the connection response.

17. (Original) The apparatus of claim 16, wherein the storage means stores the ATM connection information, server mapping information, server QoS information, and server address information in a connection database.

18. (New) A method comprising:

receiving a message from a plurality of servers in response to a query message, the message containing service indicator data indicative of a level of service provided by the respective server;

storing the service indicator data; and

sending a message to a client machine to indicate the availability of one or more of the plurality of servers to provide a level of service required by a client application.

19. (New) The method of claim 18 wherein the service indicator data indicates the availability of the level of service at the respective server.

20. (New) The method of claim 18 wherein the service indicator data indicates the availability of PVC connections and SVC connections at the respective server.

21. (New) The method of claim 18 wherein the service indicator data indicates the Quality of Service availability at the respective server.

22. (New) The method of claim 18, further comprising selecting a server for communication with the client application based at least in part on the service indicator data.

23. (New) A method comprising:

formulating a query message at a client machine containing a service level requirement of a client application;

sending the query message to a plurality server machines;

receiving a response message from at least a portion of the plurality of server machines in response to the query message, the response message containing data indicative of a level of service provided by the respective server machine; and

connecting the client machine to a selected one of the server machines based at least in part upon the response message.

24. (New) The method of claim 23 wherein the query message includes a source IP address.

25. (New) The method of claim 23 wherein the data in the response message indicates the availability of PVC connections and SVC connections at the respective server.

26. (New) The method of claim 23 wherein the data in the response message indicates the Quality of Service availability at the respective server.

27. (New) The method of claim 23 wherein connecting the client machine to the server machine comprises connecting the client machine to the server machine using a PVC connection when the response message indicates that the PVC connection is available.

28. (New) The method of claim 23 wherein connecting the client machine to the server machine comprises connecting the client machine to the server machine using a SVC connection when the response message indicates that the SVC connection is available.

29. (New) An apparatus comprising:

a service selector configured to formulate a connection request for transmission to a server, the connection request indicating service level requirements for a client application;

a data structure configured to receive a connection response from the server indicating service level capability of the server; and

a communications controller configured to connect the client application to the server based at least in part upon the service level capability.

30. (New) The apparatus of claim 29 wherein the service selector is configured to store an internet protocol (IP) address of the client machine in the connection request.

31. (New) The apparatus of claim 29 wherein the connection response indicates that a PVC connection exists at the server machine, the data structure further configured to store VPI/VCI connection pair values.

32. (New) The apparatus of claim 31 wherein the communications controller is configured to establish a PVC connection between the client machine and the server machine when the VPI/VCI connection pair values are detected in the server information.

33. (New) The apparatus of claim 29 wherein the connection response indicates that a SVC connection exists at the server machine, the data structure further configured to store an ATM address of the server machine.

34. (New) The apparatus of claim 33 wherein the communications controller is configured to establish a SVC connection between the client machine and the server machine when the ATM address of the server machine is detected in the server information.

35. (New) The apparatus of claim 29 wherein the communications controller is configured to extract ATM connection information, server mapping information, server QoS information, and server address information from the connection response.

36. (New) The apparatus of claim 35 wherein the data structure is configured to store information extracted from the connection response by the communications controller.

37. (New) The apparatus of claim 29 wherein the level of service is a Quality of Service (QoS) level and the selector is configured to gather QoS requirements for the client application.

38. (New) The apparatus of claim 37 wherein the data structure is configured to store data related to QoS capability of the server.

39. (New) The apparatus of claim 29 wherein the selector is further configured to formulate a connection request for transmission to a plurality of servers.

40. (New) The apparatus of claim 39 wherein the data structure is further configured to receive a connection response from the plurality of servers indicating service level capability of the respective server.

41. (New) The apparatus of claim 39 wherein the level of service is a Quality of Service (QoS) level and the data structure is configured to store data related to QoS capability of the plurality of servers.

42. (New) The apparatus of claim 39 wherein the communications controller is further configured to connect the client application to a selected one of the plurality of servers based at least in part upon the service level capability of the selected one of the plurality of servers.

43. (New) The apparatus of claim 29 wherein the level of service is a Quality of Service (QoS) level and the communications controller is further configured to connect the client application to a selected one of the plurality of servers based at least in part upon the QoS capability of the selected one of the plurality of servers.